

What Is Claimed Is:

1. A method for smoothing and polishing surfaces by treating them with energetic radiation (3), in particular laser radiation, in which the to-be-smoothed surface (1) is remelted in a first treatment step using said energetic radiation (3) and employing first treatment parameters at least once down to a first remelting depth (10), which is greater than a structural depth of the to-be-smoothed structures of said to-be-smoothed surface and is  $\leq 100 \mu\text{m}$ , wherein  
in said first treatment step continuous energetic radiation or pulsed energetic radiation with a pulse duration of  $\geq 100 \mu\text{s}$  is employed and said surface (1) is remelted down to a first remelting depth (10) of 5 to  $100 \mu\text{m}$ .
2. A method according to claim 1,  
wherein in a second treatment step using said energetic radiation (3) and employing second treatment parameters, micro-roughness remaining on said surface (1) after said first treatment step is leveled by remelting down to a second remelting depth (14), which is less than said first remelting depth (10), and by evaporating roughness peaks (15).
3. A method according to claim 1 or 2,  
wherein said first treatment parameters are selected in such a manner that no ablation of material occurs.
4. A method according to one of the claims 2 to 3,  
wherein pulsed laser radiation with a pulse duration of  $\leq 1 \mu\text{s}$  is employed in said second treatment step.
5. A method according to one of the claims 1 to 4,  
wherein said surface (1) is remelted in said first

treatment step down to a first remelting depth (10) of approximately 10 to 80  $\mu\text{m}$ .

6. A method according to one of the claims 2 to 5, wherein said surface (1) is remelted in said second treatment step down to a second remelting depth (14) of maximally 5  $\mu\text{m}$ .
7. A method according to one of the claims 1 to 5, wherein said surface (1) is remelted in said first treatment step multiple times in succession.
8. A method according to claim 7, wherein with each new remelting step, said first remelting depth is selected less deep than in the previous remelting step.
9. A method according to claim 7 or 8, wherein said energetic radiation (3) is led in parallel paths (6) over said surface (1) with successive remelting steps of a section (4) of said surface (1) being carried out with paths (6) turned at an angle.
10. A method according to one of the claims 1 to 9, wherein treatment in said first treatment step occurs successively in a multiplicity of adjacent sections (4) of said surface (1), with the treatment parameters being changed continuously or in steps towards the border of said sections (4) in such a manner that said first remelting depth (10) decreases to said border of said sections (4).
11. A method according to one of the claims 1 to 10, wherein in order to retain edges (13) on said surface (1), said first treatment parameters of said first treatment step are changed continuously or in steps in such a manner that said first remelting depth (10) decreases toward said edges (13).

- 12.A method according to one of the claims 1 to 11,  
wherein said laser radiation (3) is led on one or a  
multiplicity of meandering paths (6) over said surface (1).
- 13.A method according to one of the claims 2 to 12,  
wherein said surface (1) is impinged with protective gas  
during said first and said second treatment step.
- 14.A method according to one of the claims 1 to 13,  
wherein treatment occurs with a beam cross section in form  
of a line or with a rectangular beam cross section of said  
energetic radiation (3).
- 15.A method according to one of the claims 1 to 14,  
wherein said to-be-smoothed surface (1) is preheated before  
remelting.
- 16.A method according to one of the claims 1 to 15,  
wherein said first treatment parameters are selected in  
such a manner that structures of significance of said to-  
be-smoothed surface (1) are retained during remelting.